

**REMARKS**

Applicants have amended claims 1, 5, 11, 12-16, and 18, canceled claims 20-23 without prejudice, and added new claims 24-67. Claims 1-19 and 24-67 are pending.

In the Office Action, claim 1 was rejected in an obviousness-type double-patenting rejection based on claim 10 of U.S. Patent No. 6,651,618; and claims 11-16 and 18-23 were rejected in an obviousness-type double-patenting rejection based on claims 7, 9-13 and 15-20 of U.S. Patent No. 6,688,280.

Although Applicants do not necessarily agree with the obviousness-type double patenting rejections, Applicants submit herewith a Terminal Disclaimer to obviate those claim rejections. Accordingly, the obviousness-type double patenting rejections should be withdrawn.

Claims 1, 2, 4, 6 and 7 were rejected under 35 U.S.C. 102(e) as being anticipated by Beck et al. (U.S. Patent No. 6,273,076).

Applicants respectfully submit that the Section 102(e) rejection based on Beck et al. should be withdrawn because that reference lacks any teaching of the subject matter recited in amended claim 1. To be more specific, Beck et al. does not disclose an engine including, among other elements, “a controller configured to operate [a] fuel supply system to supply a pilot injection of fuel before a main injection of fuel,” as set forth in claim 1. Consequently, the rejection of independent claim 1 and dependent claims 2, 4, 6, and 7 should be withdrawn.

Claims 1-7 were rejected under 35 U.S.C. 102(e) as being anticipated by Macor et al. (U.S. Patent No. 6,237,551).

Applicants respectfully submit that the Section 102(e) rejection based on Macor et al. should be withdrawn for the following reasons.

Regarding independent claim 1, Macor et al. lacks any teaching of an engine including, among other elements, “a controller configured to operate [a] fuel supply system to supply a pilot injection of fuel before a main injection of fuel,” as recited in amended claim 1. Therefore, the rejection of independent claim 1 and dependent claims 2-4, 6, and 7 should be withdrawn.

Concerning independent claim 5, Applicants respectfully submit that the Section 102(e) should be withdrawn because Macor et al. does not disclose “a controller configured to operate [an] intake valve to remain open for a portion of a second half of a compression stroke,” as recited in that claim.

Macor et al. discloses an engine which includes variable valve actuation, including varying the actuation timing of the intake valve. The Office Action at page 4 cites Fig. 7 and alleges that the figure “shows the intake valve is closing at about 650 degrees CA, which would be more than halfway through the compression stroke.”

Applicants respectfully disagree with the apparent interpretation of Fig. 7 and the apparent interpretation of Macor et al. in general. An analysis of Fig. 7 reveals that, if the curve represents the displacement of the intake valve, then the only time that the intake valve would be closed is from about 270 degrees to about 340 degrees; that is, during the exhaust stroke. The intake valve would be open, by at least by about 2.5 mm, for the remainder of the engine cycles, including the combustion stroke. This is clearly not a plausible engine operating mode.

Applicants refer to col. 6, lines 15-16, which states that Fig. 7 shows the displacement of piston 7 associated with the intake valve(s). As Fig. 1 illustrates, the piston (element 7) is part of the variable valve actuation system. Thus, the curve of

Fig. 7 does not show the intake valve being displaced into the latter half of the compression stroke, but rather shows the piston 7 being displaced during this time.

Applicants respectfully note that Figs. 9 and 17 of Macor et al. indicate displacement of the intake valve as clearly labeled in the graphs. The intake valve does not remain open into the latter half of the compression stroke, but rather closes before the 330 degree halfway point is reached. Thus, it is evident that Macor et al. does not disclose, teach or even suggest operating the intake valve to "remain open for a portion of a second half of a compression stroke," as claimed in Applicants' claim 5. Applicants contend, therefore, that claim 5 is patentably distinct over Macor et al.

Claims 3 and 5 were rejected under 35 U.S.C. 103(a) as being unpatentable over Beck et al. in view of Macor et al.

Claim 3 depends from claim 1. As noted above, neither Beck et al. nor Macor et al. teaches the subject matter of claim 1. Thus, the Section 103(a) rejection of claim 3 should be withdrawn.

Turning to the Section 103(a) rejection of claim 5, the Office Action at page 4 states that Beck et al. "is silent regarding how much the intake valve closing is delayed." According to Applicants understanding, the Office Action at pages 4-5 acknowledges that Beck et al. does not disclose the subject matter of claim 5, including "a controller configured to operate [an] intake valve to remain open for a portion of a second half of a compression stroke." As explained above in connection with the Section 102(e) of claim 5, Macor et al. also lacks any teaching of the subject matter of claim 5. Even hypothetically if the references could be combined in the manner proposed in the Office

Action, the subject matter of claim 5 would not be suggested. Thus, the Section 103(a) rejection of claim 5 should be withdrawn.

Claims 8-23 were rejected under 35 U.S.C. 103(a) as being unpatentable over Beck et al. in view of Becklund and et al. (U.S. Patent No. 5,408,979).

Applicants respectfully submit that the Section 103(a) rejection of claims 8-23 should be withdrawn for at least the following reasons.

Regarding claims 8-10, those claims depend from claim 1 and should, therefore, be allowable for at least the same reasons claim 1 is allowable. For example, dependent claims 8-10 should be allowable because neither Beck et al. nor Backlund et al. teaches “a controller configured to operate [a] fuel supply system to supply a pilot injection of fuel before a main injection of fuel,” as recited in amended claim 1.

Focusing on independent claims 11 and 16, neither Beck et al. nor Backlund et al. discloses or suggests “operating [a] fuel supply system to inject a pilot injection of fuel before a main injection of fuel,” as recited in amended claim 11, or “a controller [that] is configured to operate [a] fuel supply system to supply a pilot injection of fuel before a main injection of fuel,” as recited in amended claim 16.

Turning now to independent claims 14 and 18, the references cited in the Section 103(a) rejection do not have any teaching or suggestion of “operating [an] intake valve to remain open for a portion of a second half of the compression stroke of the piston,” as recited in claim 14, or a “controller [that] is configured to operate [an] intake valve to remain open for a portion of a second half of the compression stroke of the piston,” as recited in claim 18. As discussed above, the Office Action apparently acknowledges that Beck et al. lacks any disclosure of an intake valve remaining open for a portion of a

second half of a compression stroke. Backlund et al. also does not have any teaching of such subject matter.

Since claims 12, 13, 15, 17, and 19 depend from one of independent claims 11 or 16, those independent claims should be allowable for at least the same reasons the claims from which they depend are allowable.

As mentioned above, new claims 24-67 have been added. None of the references cited in the claim rejections teaches or suggests the subject matter of those new claims. For example, independent claim 34 is similar to claim 21 of U.S. Patent No. 6,688,280, which issued from the parent application; independent claim 45 recites an engine that is “configured to control [a] fuel supply system so as to inject fuel to the combustion chamber during a portion of a combustion stroke of the piston;” independent claim 56 recites “a variable intake valve closing mechanism configured to hold [an] intake valve open independent of [a] cam operating to hold the intake valve open;” and independent claim 64 recites “holding [an] intake valve open when [a] cam no longer holds the intake valve open.”

For at least the reasons explained above, all of the pending claims should be allowable. If the Examiner believes the present response does not place the application in condition for immediate allowance, the Examiner is respectfully requested to call Applicants’ undersigned representative (571-203-2774) to schedule an interview.

Applicants respectfully requests reconsideration of this application, the withdrawal of all of the claim rejections, and the timely allowance of the pending claims.

The Office Action contains a number of statements relating to the claims of the present application, the claims of other patents, and cited references. Applicants

decline to subscribe to any statement or assertion in the Office Action, regardless of whether it might be specifically mentioned above.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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